High Resolution VIL Algorithm

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Key FAA Systems that Benefit from Improved NEXRAD Algorithms

Integrated Terminal Weather System

Medium Intensity Airport Weather System

NEXRAD Algorithms

AP Edited Comprefl

High Resolution VIL

Data Quality Assurance

Enhanced Echo Tops

MIGFA

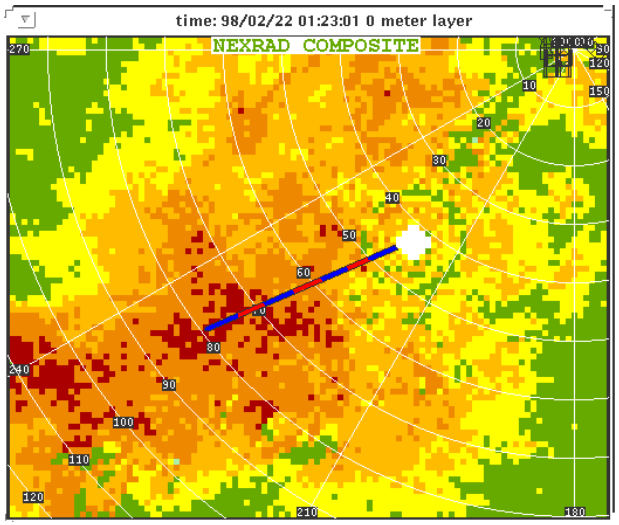
Weather And Radar Processor

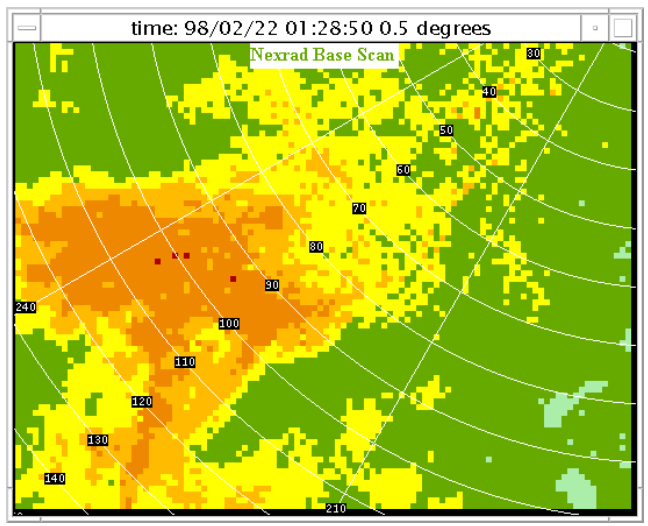
Corridor Integrated Weather System

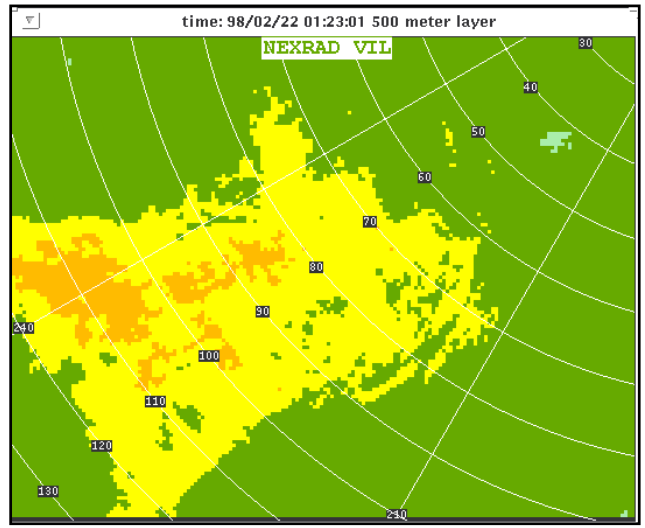
Why VIL vs. Composite Reflectivity?

- Issue is how to characterize storm intensity given values at a number of different altitudes
- Layer Composite Reflectivity
  - Takes maximum reflectivity from any altitude
- Vertically Integrated Liquid (VIL)
  - Converts reflectivity at each height to equivalent water mass
  - Determines how much water is being held aloft
  - Argument: this is closely related to strength of updraft
- Situations where VIL is better
  - "Bright band"
  - Ground clutter / AP

NEXRAD Products Comparison During a Bright Banding Case

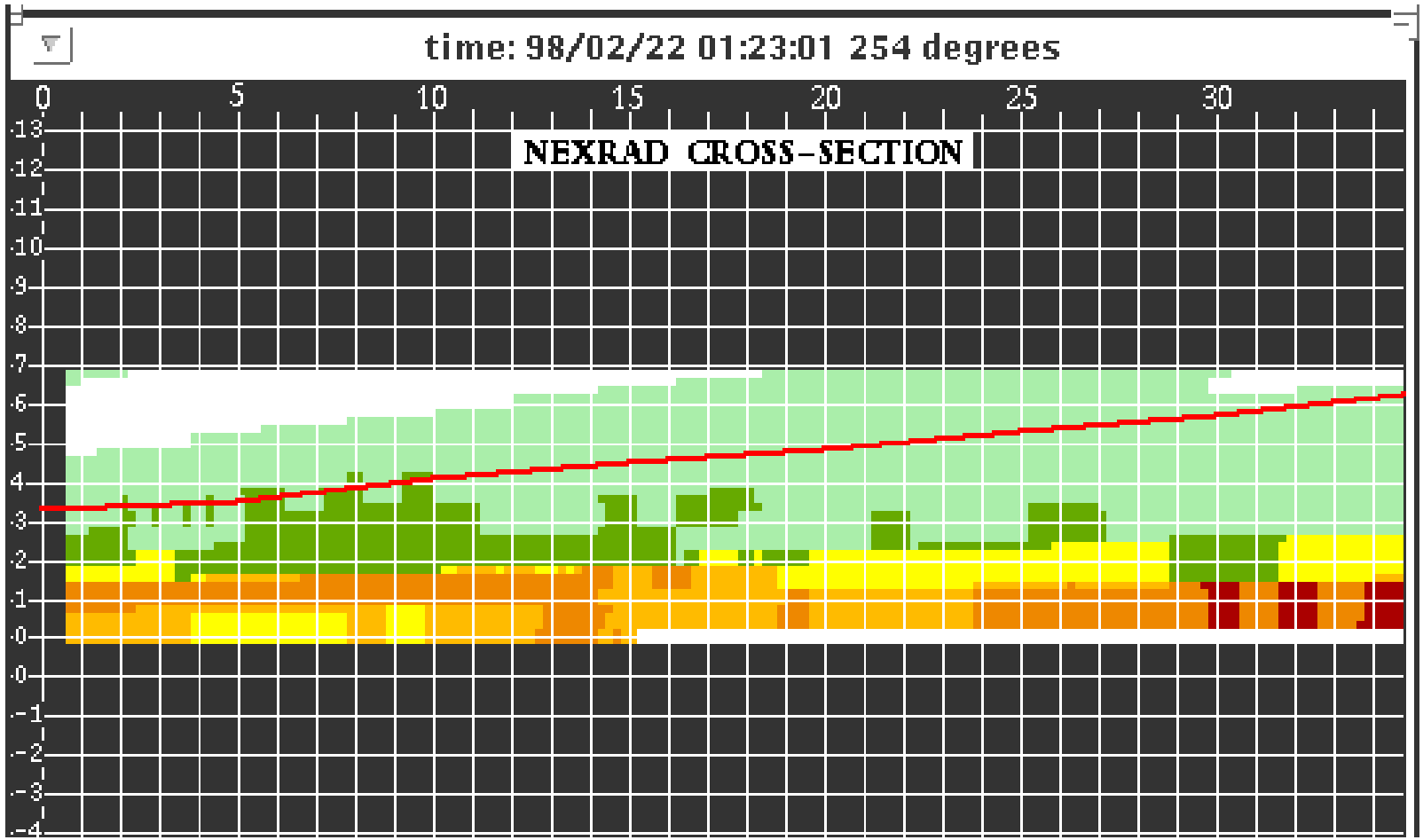






- On the left is Composite Reflectivity image, the line shows the location of the NEXRAD cross section (next slide)
- The center image is the lowest tilt of the NEXRAD and similar to the BRRM product used in the WARP and on ETMS.
- The image on the right shows NEXRAD based VIL product created by CIWS

NEXRAD Cross Section of a Stratiform event



- Vertical cross section (RHI) of a Stratiform rain event showing the stratified precipitation or “Bright Banding”

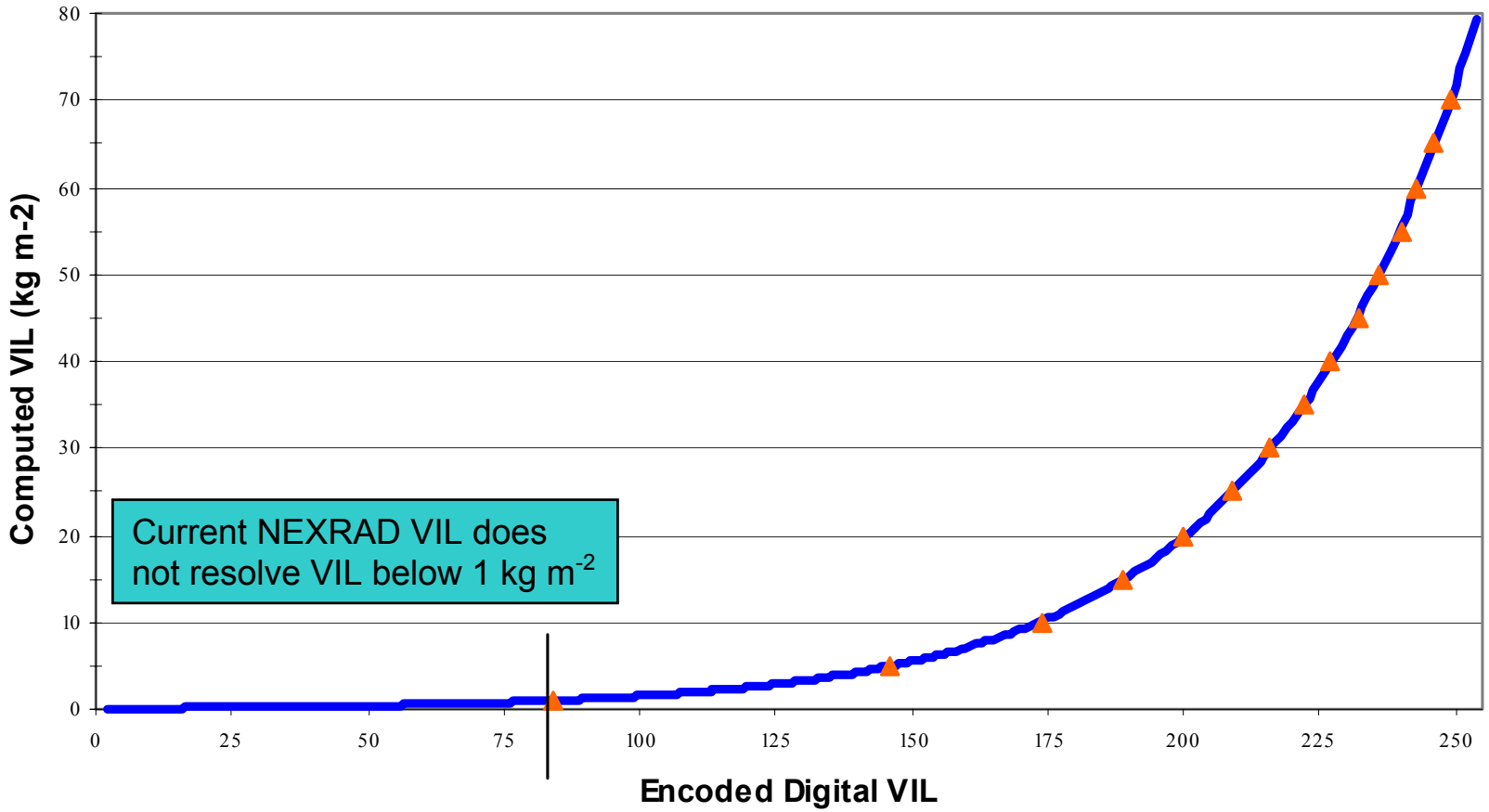
Why High Resolution VIL (HRVIL) vs. VIL

- VIL an excellent proxy for severe convection
  - Critical flight planning element
  - Even small changes in VIL important
- Some problems with existing NEXRAD VIL
  - Coarse spatial resolution (4 km)
  - Coarse data level resolution (16 levels)
  - Short range (230 km)
- MIT/LL FAA solution – HRVIL
  - Polar format VIL maintains inherent radar resolution (1^0 x 1 km)
  - 256 data levels replace 16 data levels
  - Full range (460 km)
- Key FAA systems will utilize HRVIL
  - CIWS, MIAWS, WARP
  - NCWF, TCWF

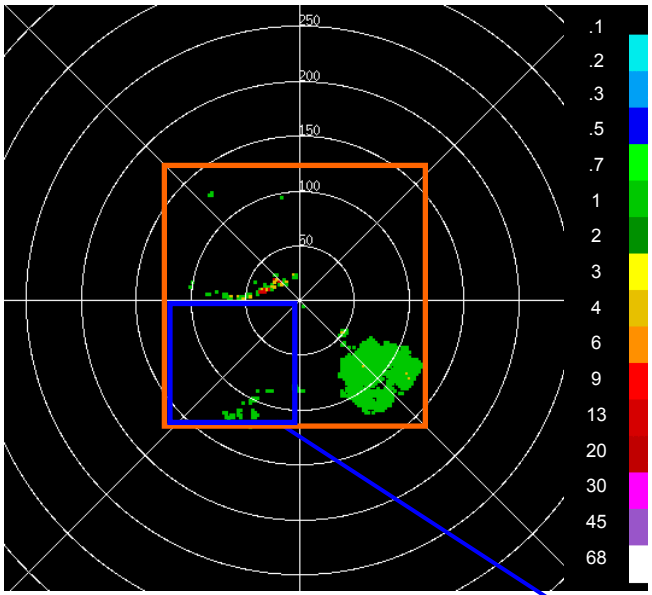
High Resolution VIL (HRVIL) Computation

- Same basic NEXRAD VIL conversion and integration used
  - Except no lower limit of 18 dBZ
    - All valid range gates contribute
- HRVIL computed to maximize depiction of structure
  - 256 data levels
    - VIL < 1 kg m^{-2} now resolved
    - 200 data levels vs. 5 for VIL range of 0-20 kg m^{-2}
  - Polar output
    - mitigates Cartesian smoothing
  - Full range calculations
    - intended to benefit 2 hour convective forecasts

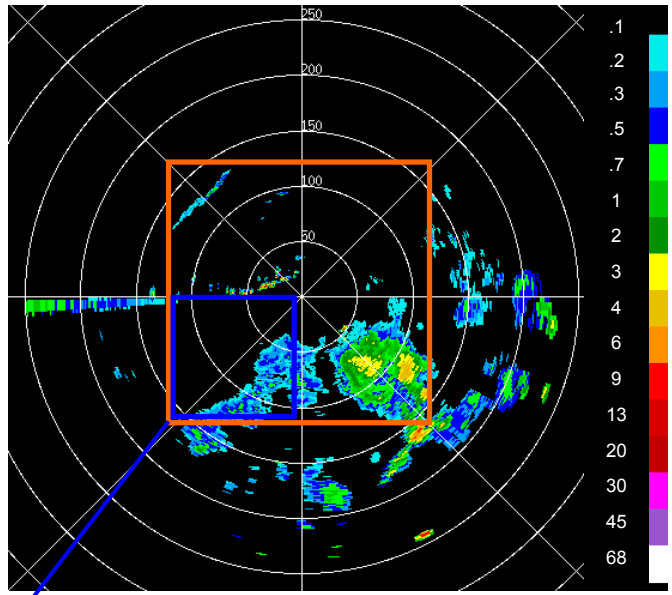
High Resolution VIL Curve Compared to Current VIL Data Levels



Current and High Resolution VIL Comparison



230 km range of current VIL product denoted by orange box



Current VIL product

230 km range

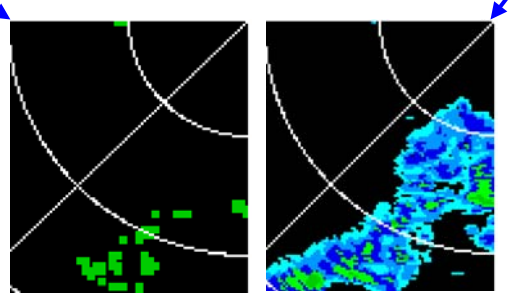
18 dBZ min. threshold

4 x 4 km resolution

Cartesian

16 data levels

continues in Build 2+



Southwest quadrant zoom

(note higher resolution detail on right)

Build 2 HighRes VIL product

460 km range

no dBZ threshold

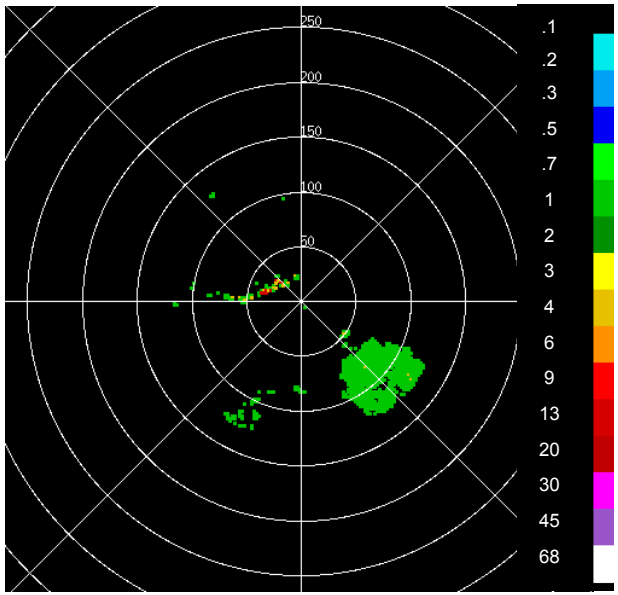
1 degree x 1 km resolution

Polar

256 data levels

release September 30, 2002

HighRes VIL Comparison – Sun strobe



Current VIL product

230 km range

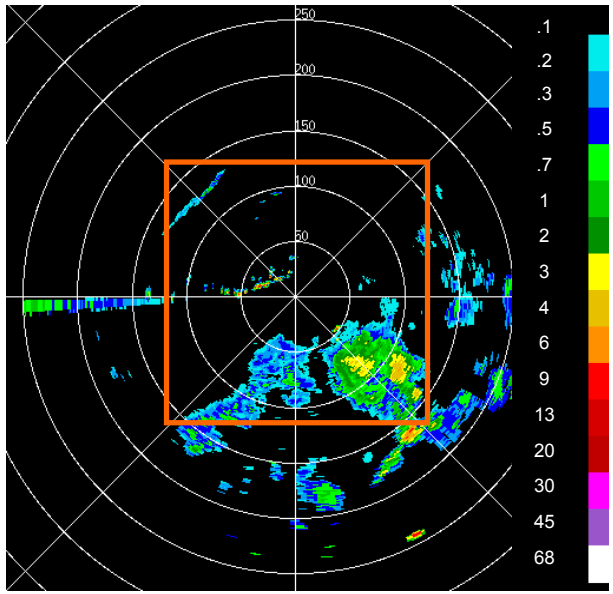
18 dBZ min. threshold

4 x 4 km resolution

Cartesian

16 data levels

continues in Build 2



Build 2 HighRes VIL product

460 km range

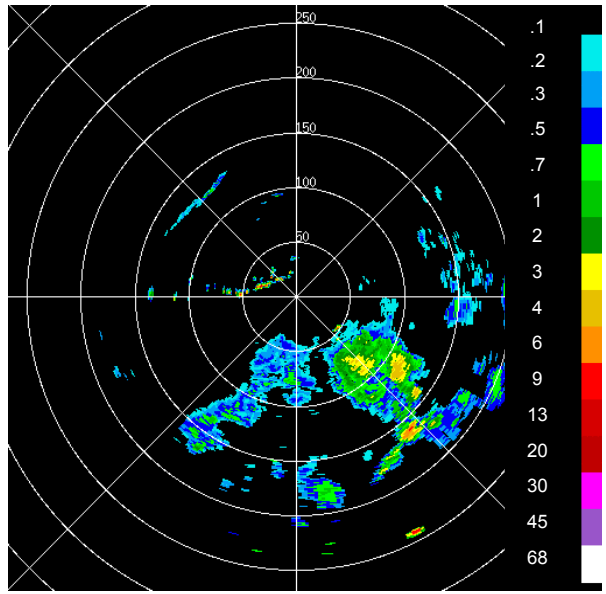
no dBZ threshold

1 degree x 1 km resolution

Polar

253 data levels

release September 30, 2002



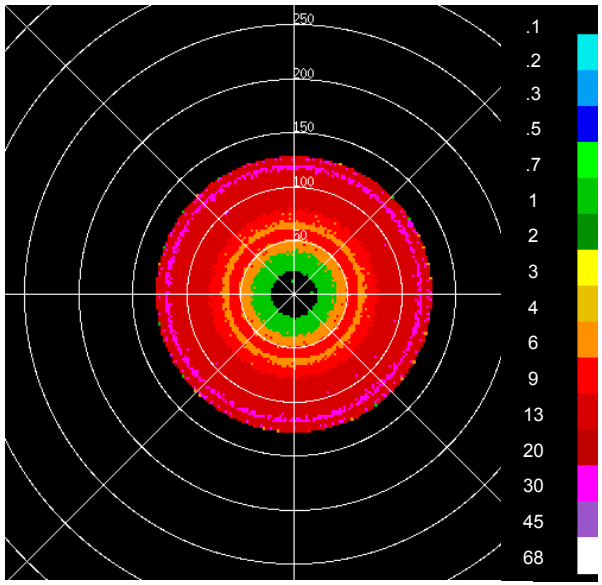
Future Build 3 HighRes VIL product

AD and AP Edited data input (notice strobe removal)

other specs as HighRes VIL Build 2

release March 31, 2003

HighRes VIL Comparison – Bull`s-eye



Current VIL product

230 km range

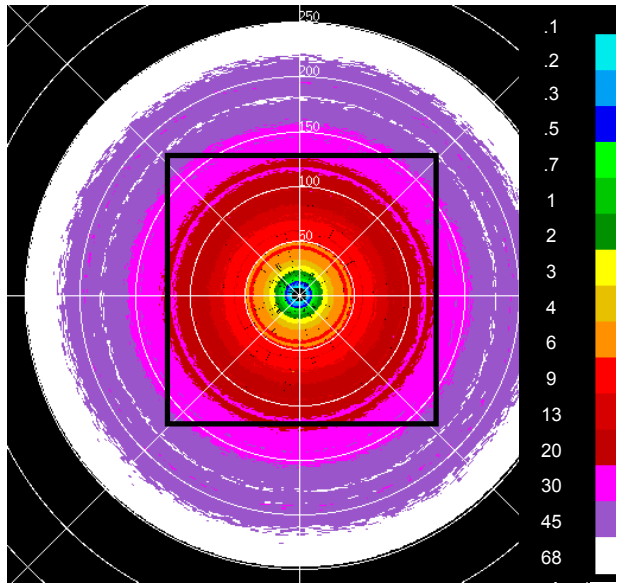
18 dBZ min. threshold

4 x 4 km resolution

Cartesian

16 data levels

continues in Build 2



Build 2 HighRes VIL product

460 km range

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Polar

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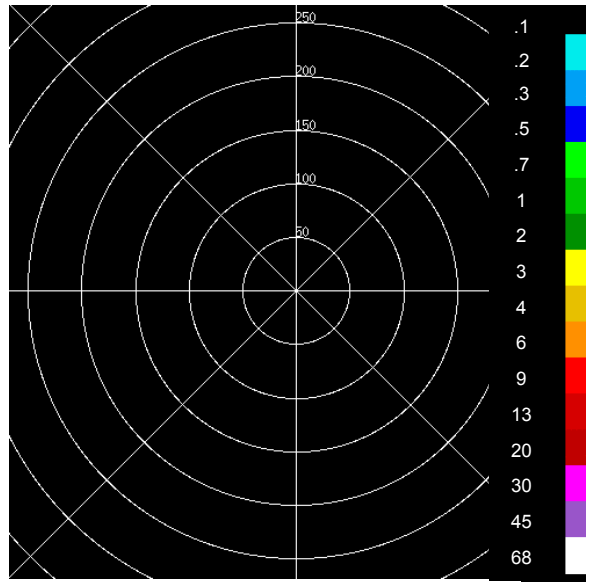

Future Build 3 HighRes VIL product

AD and AP Edited data input (notice bull's-eye removal)

other specs as HighRes VIL Build 2

release March 31, 2003

High Resolution VIL and ORPG Builds

- Build 2 version provided to the ROC Jan. 31, 2002 for deployment beginning Sept. 30, 2002
- Computationally similar to current NEXRAD VIL
- Polar format and digital representation significantly improve depiction of VIL vs. NEXRAD VIL
- For Build 3, the algorithm is being retooled to receive DQA algorithm data stream to eliminate contaminated dBZ input
- Build 3 hand-off to ROC this July